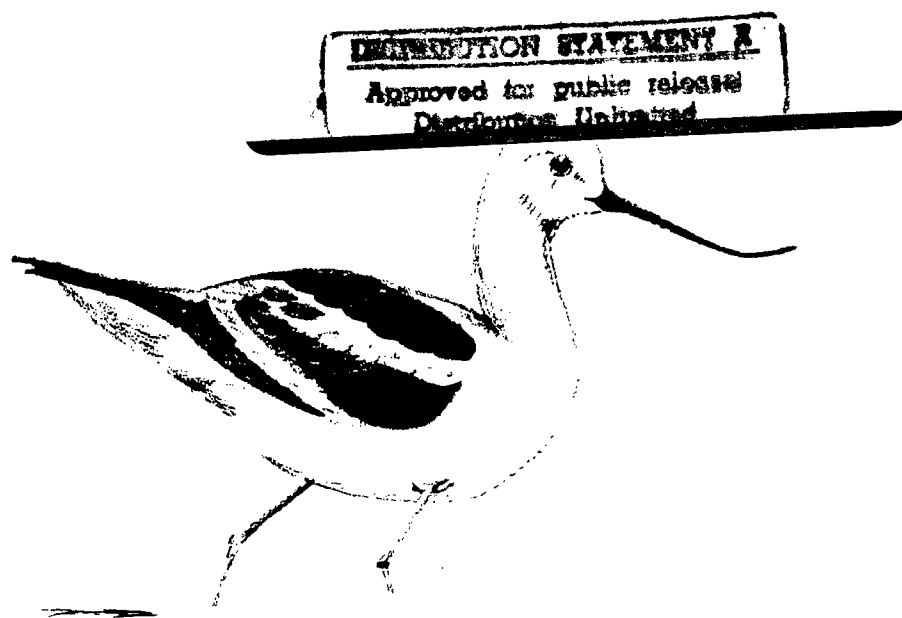


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Avian Use of Sheyenne Lake and Associated Habitats in Central North Dakota



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AVIAN USE OF SHEYENNE LAKE AND ASSOCIATED HABITATS IN CENTRAL NORTH DAKOTA

By Craig A. Faanes



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Avian Use of Sheyenne Lake and Associated Habitats in Central North Dakota

by

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Abstract

A study of avian use of various habitats was conducted in the Sheyenne Lake region of central North Dakota during April-June 1980. Population counts of birds were made in wetlands of various classes, prairie thickets, upland native prairie, shelterbelts, and cropland. About 22,000 breeding bird pairs including 92 species that nested occupied the area. Population means for most species were equal to or greater than statewide means. Red-winged blackbird (*Agelaius phoeniceus*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), mourning dove (*Zenaida macroura*), and blue-winged teal (*Anas discors*) were the most numerous species, and made up 32.9% of the total population. Highest densities of breeding birds occurred in shelterbelts, semipermanent wetlands, and prairie thickets. Lowest densities occurred in upland native prairie and cropland. The study area was used by 49.6% of the total avifauna of the State, and 51% of the breeding avifauna of North Dakota probably nested in the study area. The diversity of birds using the area was unusual in that such a large number of species occupied a relatively small area. The close interspersed of many native habitats, several of which are unique in North Dakota, probably accounted for this diversity. Data on dates of occurrence, nesting records, and habitat use are presented for the 175 species recorded in 1980. Observations of significance by refuge staff are also provided.

Habitats of the Northern Great Plains are vital to many species of birds. Stewart (1975) related numerous early observations of prairie wildlife populations that included impressive assemblages of breeding waterfowl and an abundance of nesting passerines. These populations remained bountiful until the mid-1800's, when the first pioneers began to convert native grasslands to cropland and wetlands were drained to facilitate expanding farming operations.

Native wetland and upland habitats in the Northern Great Plains are still being altered or destroyed each year through agricultural practices. Destruction of natural basin wetlands in North Dakota was estimated at over 8,100 ha annually from 1967 to 1980 (U.S. Fish and Wildlife Service, unpublished data). Weller (1979) reviewed the impact of this type of habitat loss on waterfowl and other marsh birds in Iowa and found that populations of many marsh birds were reduced or extirpated by wetland drainage. Conversion of native grasslands to cropland also has an impact on breeding bird populations.

The Garrison Diversion Unit, a large public works project in North Dakota, under construction by the U.S. Water and Power Resources Service, will have substantial impacts on both upland and wetland habitats (International Garrison Diversion Study Board 1976). As planned, this project would supply agricultural irrigation water to nearly 101,214 ha of cropland in central and southeastern regions of North Dakota. Construction of the project, however, will destroy 30,539 ha of wetlands and 26,979 ha of upland native prairie. One strategic project feature of Garrison Diversion is the Lonetree Reservoir on the Sheyenne River in Sheridan and Wells counties (Fig. 1).

Lonetree Reservoir will serve as the principal water-regulation reservoir for the Garrison Diversion Unit (U.S. Bureau of Reclamation 1974). At full capacity, the reservoir will occupy 8,128 ha that are now wetlands, upland native prairie, woodlands, and cropland. About 40 km of the upper reaches of the Sheyenne River, and the Sheyenne National Wildlife Refuge, will be inundated.

The value of the study area to wildlife has long been

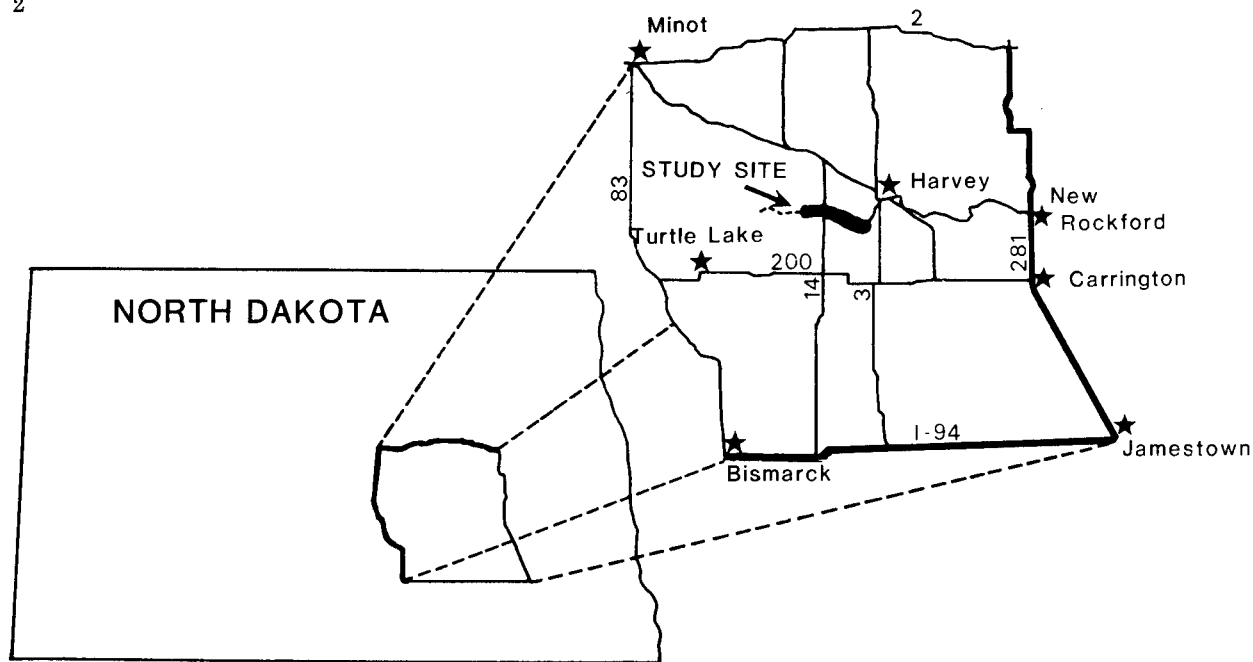


Fig. 1. Location of the Sheyenne Lake Study Area in relation to major cities and roadways in central North Dakota.

recognized, but specific investigations to determine the importance of the area to migrant and nesting birds have not been conducted. Knowledge of numbers and species of birds using Sheyenne Lake and adjacent habitats is of importance to adequately determine impacts caused by construction of Lonetree Reservoir.

From April to June 1980, I conducted investigations of habitats and bird populations in the proposed site of the Lonetree Reservoir. The objectives of the study were to (1) determine the species composition of birds using Sheyenne Lake and adjacent habitats during spring migration and nesting periods, (2) determine the utilization of these habitats by migrant and nesting birds, and (3) describe the diversity of breeding birds in various habitat types.

Study Area

Lonetree Dam on the Sheyenne River, Wintering Dam on a tributary to the Wintering River, James River Dike, and seven smaller dikes will be constructed to impound water from the Missouri River in Lonetree Reservoir. Water in the reservoir will have a maximum depth of 24 m and will fluctuate up to 6 m during the annual operating season (U.S. Bureau of Reclamation 1974). The dam will be constructed in the valley of the Sheyenne River about 8 km southwest of Harvey, North Dakota. The reservoir will extend west from the dam for about 40 km.

The Sheyenne Lake area occurs at the extreme southeastern corner of the Northwestern Drift Plain physiographic region of North Dakota (Stewart and Kantrud

1972). A glacial meltwater channel that contains the Sheyenne River is the prominent topographic feature of the study area. Bedrock consists of Cretaceous-age Pierre Shale and Dakota Sandstone, overlain by undifferentiated Pleistocene glacial till (Simpson 1929). The valley has a thin mantle of alluvial soils and channel outwash deposits (U.S. Bureau of Reclamation 1974). Predominant soils in the region are silt loam and clay.

The climate is continental, with hot, dry summers and cold winters. Mean annual precipitation at Drake, North Dakota, 11 km north of the study area, is 55.8 cm and the average July temperature is 21.8°C (U.S. Department of Commerce 1979). The spring and summer of 1980 were dry and hot compared with normal precipitation and temperature (Table 1).

Table 1. *Climatological characteristics during 1980 at the Sheyenne Lake Study Area, compared with the norm.*

Month and feature	1980	Normal	Percentage deviation
April			
Precipitation (cm)	Trace	3.58	- 100
Temperature (°C)	9.2	5.1	+ 44.6
May			
Precipitation (cm)	3.37	6.09	- 44.7
Temperature (°C)	16.3	12.0	+ 26.4
June			
Precipitation (cm)	15.6	8.89	+ 43.0
Temperature (°C)	18.8	17.2	+ 8.51

Table 2. *Total area, proportional distribution, and area censused of habitat types of the Sheyenne Lake Study Area.*

Habitat type	Area (ha)	Percent of study area	Area censused (ha)	Percent of habitat sampled
Uplands				
Cropland	3,872.5	47.1	421.7	10.9
Native prairie	1,941.3	23.6	460.4	23.7
Shelterbelt	170.0	2.1	5.3	3.1
Subtotal	5,983.8	72.8	887.4	
Wetlands				
Ephemeral	46.5	0.6	a	
Wet meadow	572.5	6.9	86.7	15.1
Seasonal	222.7	2.7	23.8	10.7
Semipermanent	249.8	3.0	19.5	7.8
Permanent	697.9	8.5	75.5	10.8
Alkali	207.7	2.5	43.9	21.1
Prairie thicket	237.6	2.9	19.3	8.1
Subtotal	2,234.7	27.1	268.7	
Grand total	8,218.5	99.9	1156.1	14.0

^aEphemeral wetlands were dry throughout the study period and were not censused.

Habitats

The five major habitat types in the study area were wetlands, prairie thicket, upland native prairie, shelterbelt, and cropland. A general description of these habitats is provided in Stewart (1975). Cropland was the predominant habitat type, followed by wetlands, and upland native prairie (Table 2). A description of the vegetative characteristics of these habitats follows.

Wetlands

Wetlands made up over 27% of the study area. Six major wetland classes (Stewart and Kantrud 1971) occurred in the study area: ephemeral (Class I), temporary (Class II), seasonal (Class III), semipermanent (Class IV), permanent (Class V), and alkali (Class VI). Because of the hot and dry spring of 1980, all ephemeral wetlands were dry, and variation in wetness of seasonal wetlands was considerable. Emergent vegetation in seasonal wetlands included tall mannagrass (scientific names of plants mentioned in the text are provided in Appendix A), slough grass, whitetop, slough sedge, western waterplantain, and marsh smartweed. Emergent vegetation of semipermanent wetlands was primarily common cattail, hardstem bulrush, slender bulrush, and river bulrush. Emergent vegetation of permanent wetlands occurred in narrow bands around the periphery of the wetland and in bays. Common cattail, river bulrush, and hardstem bulrush were the predominant emergent species in permanent wetlands. Submerged aquatic vegetation in semipermanent and permanent wetlands was characterized by clasping leaf pondweed, sago pondweed, coontail, and water milfoil. Little vegetation occurred in alkali wetlands. No emergent vegetation occurred on these wetlands in 1980 due to low water levels,

and submerged vegetation was dominated by saltwater widgeongrass. The dry, shallow marsh zone was dominated by saltgrass and alkaligrass. Slightly brackish wet meadows occurred adjacent to brackish or saline basin wetlands, or intermittently along reaches of the Sheyenne River. Vegetation in wet meadows was regulated primarily by the salinity of groundwater. Important species at Sheyenne Lake were fowl mannagrass, phragmites, water sedge, northern reedgrass, prairie cordgrass, woolly sedge, slender sedge, and Baltic rush.

Prairie Thickets

Prairie thickets occurred to a limited extent, but I found them to be the most diverse habitat type in the study area, both in terms of vegetation and associated birds. Prairie thickets occupied the lower reaches of coulees and the soils were water-soaked. A combination of shrubs, forbs, grasses, and sedges contributed to the diversity of prairie thickets. Shrub-layer vegetation included hawthorn, wild plum, chokecherry, red raspberry, western rose, and wolfberry.

Native Mixed-grass Prairie

Vegetation typical of native mixed-grass prairie occupied about 24% of the study area. This habitat type at Sheyenne Lake conforms with the eastern mixed-grass prairie of Stewart (1975). Predominant species were blue grama, green needlegrass, needle-and-thread, prairie junegrass, and switchgrass. Numerous patches of wolfberry occurred on moist sites throughout the native prairie and dense stands of silverberry occurred on some tracts.

Shelterbelts

Shelterbelts were the least extensive of the five major habitat types in the study area. These man-established habitats were usually associated with agricultural fields, or were adjacent to farmsteads. The vegetative characteristics were variable, but box elder, common caragana, Russian olive, green ash, Rocky Mountain cedar, and Chinese elm were most prevalent. Two types of tree plantings were present on the study area: single-row windbreaks occurred in rows between fields, and multi-row shelterbelts, which were more numerous, were typically associated with farmsteads.

Cropland

Agricultural fields, producing a variety of crops, occupied 47% of the study area. Spring wheat, sunflowers, and alfalfa were the main agricultural crops.

Methods

Selection of Census Plots

Census plots (Fig. 2) were selected randomly from strata based on habitat types. I sampled a minimum of 10% of the area of each habitat except semipermanent wetlands and shelterbelts. Area of major habitats was determined from aerial photographs (scale: 1:15840), and then field-checked. I sampled upland habitats and wet meadows using 16.2-ha (0.4×0.4 km) census plots. Shelterbelts were sampled as they occurred on random plots, rather than selecting individual shelterbelts at random. Basin wetlands were sampled by selecting a minimum of 10% of the area based on wetland class. During each census, the amount of water in each basin was visually estimated. Because ephemeral wetlands were dry throughout the study, censusing was not conducted in these wetlands.

I chose 16.2-ha plots for censusing upland habitats and wet meadows instead of the 64.7-ha plots used by Stewart and Kantrud (1972). Stewart and Kantrud selected the 64.7-ha plot size because two observers were involved. They believed that complete counts of birds could be made in a 2-h census period on those plots. Census plots of this size have considerable merit for investigating large, wide-ranging groups such as waterfowl or raptors but are probably too large for small passerines with weak voices (e.g., Sprague's pipit [scientific names of birds mentioned in the text are presented in the Annotated Species Accounts] and sharp-tailed sparrow). Another reason I chose smaller sample units was time. One observer was responsible for all upland and wet-meadow sampling and I chose to use the smaller plot size because it was more manageable. Also, by censusing smaller plots more replicates of the habitat type could be examined.

Census Methods

Birds were censused in upland habitats and wet meadows by following a zig-zag course within each plot. I followed the recommendation of Bond (1957), and walked slowly for 2–3 min, then stopped for 5 min to observe territorial behavior and to note if an individual bird was in or out of the census plot. All territorial males were counted as they flushed in front of me, or as their singing locations were encountered. The numbers of females were noted for brown-headed cowbirds and Wilson's phalaropes. The numbers of indicated pairs of sexually monomorphic species (black tern, barn swallow) were derived by halving the total of individuals counted on each plot.

Breeding birds were censused only when wind speeds were < 15 km/h, and only on sunny or partly cloudy days. Censusing in open habitats and wetlands was conducted during the period of sunrise to one-half hour before sunset. Wooded habitats, including prairie thickets, were censused only between sunrise and 1100. I limited by activities in wooded habitats to early hours because song output was reduced and movements were restricted during later hours (Robbins and Van Velzen 1967; Stewart and Kantrud 1972).

Populations of breeding birds were determined by the number of indicated pairs encountered during normal nesting periods. Determination of waterfowl populations and interpretations of pairs and lone birds followed the methods of Hammond (1969). Pairs and lone males were counted as indicated pairs. Densities of all species are expressed in pairs per square kilometer.

The census period extended from 17 April to 27 June. Basin wetlands were censused for early-nesting waterfowl 17 to 23 April, mid-nesting waterfowl and large shorebirds 20 to 23 May, and late-nesting waterfowl, other marsh birds and passerines, 23 to 27 June. Refer to Stewart and Kantrud (1973) for a listing of early-, mid-, and late-nesting waterfowl species.

Census methods in wetlands varied according to wetland class (Stewart and Kantrud 1974). In seasonal wetlands, counts were made by slowly walking through the wetland and making noise to flush birds. Semipermanent and permanent wetlands were often heavily vegetated and a different method was required. All ducks in the open area were counted when we (the census team) first arrived at the wetland. Once numbers of these had been determined, we moved slowly through the vegetation and recorded additional birds that were observed. Upon completion of a census, we compared observations to determine if any birds were counted twice. Alkali wetlands had little vegetation and we censused these from a high vantage point with the use of a spotting scope. We then moved slowly around the wetland to record additional birds that may have been missed.

Breeding birds in wet meadows and upland habitats were censused during 23 to 27 June. I sampled wet meadows only during June for two reasons. First, Stewart and

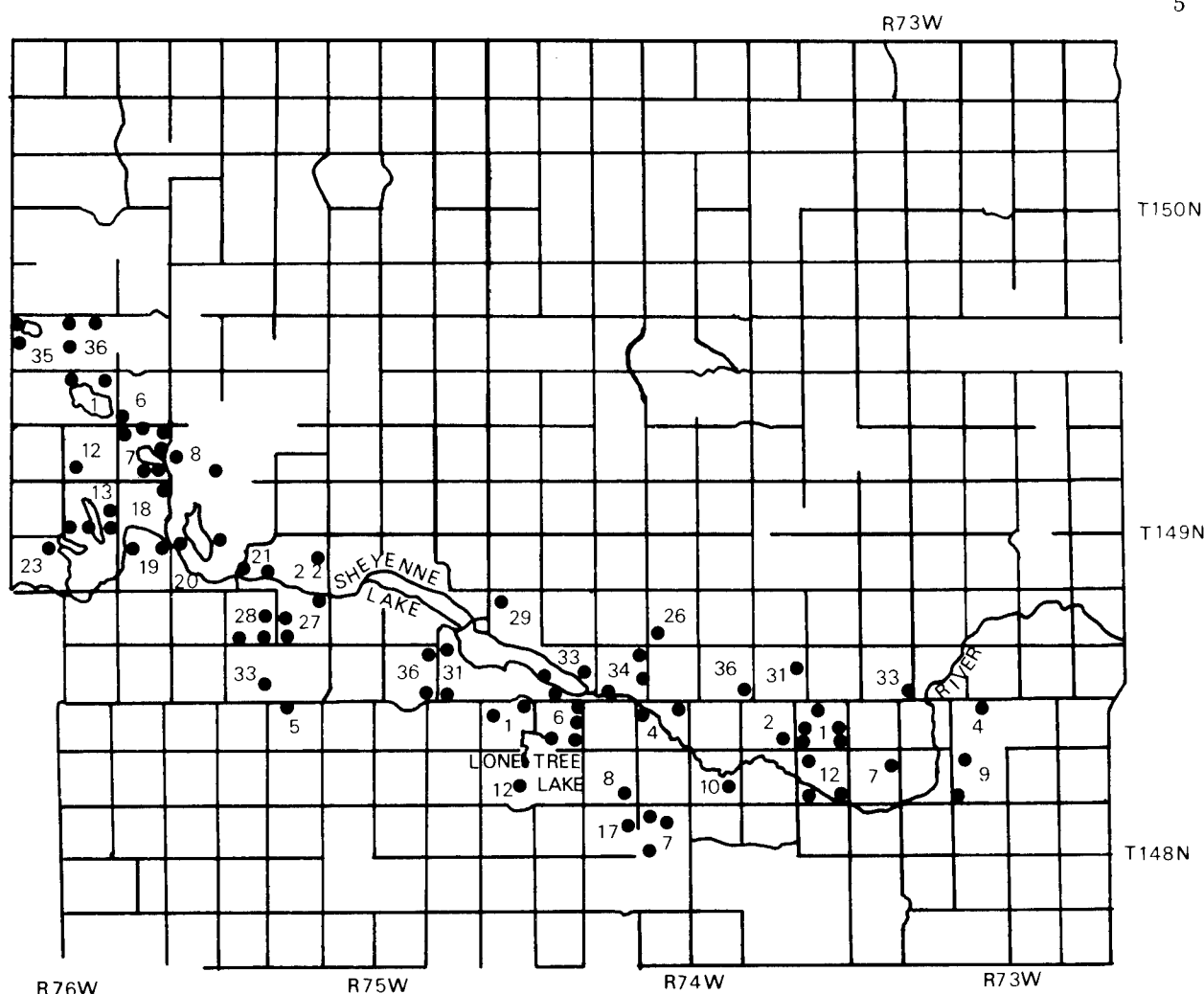


Fig. 2. Location of census plots on the study area in relation to prominent geographic features and township roads. Section numbers are provided for each section where a plot was located. Each dot represents a randomly selected 16.2-ha tract of land. One or more census plots, stratified by habitat type, were located within each tract.

Kantrud (1973) reported that <0.5% of the breeding waterfowl in North Dakota occupy wet meadows during the nesting season. Observations during April–May confirmed that few waterfowl were using wet meadows. Second, wet meadows usually occurred as broad expanses associated with intermittent portions of the Sheyenne River. Therefore, censusing breeding birds in wet meadows was more practical through the examination of 16.2-ha blocks.

In addition to intensive surveys of individual sample plots, I also conducted a 39.4-km Breeding Bird Survey (BBS) route (Robbins and Van Velzen 1967). Results obtained from this route provided another indication of relative abundance of breeding birds. Data from the BBS have been incorporated into the Species Accounts. I kept records of all breeding birds observed while moving from one census area to another, and made several visits to specific parts of the study area not sampled to search for additional

species. During all visits to the study area I investigated several sites to determine their use by migrants or breeding birds. These data are presented in Annotated Species Accounts.

Data Analysis

Population estimates for breeding birds followed the methods described by Stewart and Kantrud (1972), including the calculation of highest probability density (HPD) intervals (Johnson 1977). Bayesian confidence intervals were used because the number of breeding pairs is known to be non-negative, and because HPD intervals are more precise.

Species diversity indices, H' (Tramer 1969), and equitability, J' (Kricher 1972), were calculated for each habitat

type. Species diversity is measured by the Shannon-Weaver formula

$$H' = - \sum_{i=1}^s P_i \log_2 P_i$$

where P_i is the proportion of individuals of speciesⁱ. This index is influenced by the number of species and the number of individuals within each species. Equitability is calculated by using

$$J' = H'/H' \text{ max}$$

where H' = the species diversity index, and $H' \text{ max}$ is the maximum diversity possible in the sample. Equitability is highest when all species in the sample are as nearly equal in population as possible, and is smaller as single species become more predominant in the population.

Results and Discussion

Avian Use

During investigations of intensive but short duration, 175 bird species were recorded in the study area in 1980. The most recent compilation of North Dakota birds indicates that 353 species have been recorded in the State (C. A. Faanes, unpublished data). Thus, 49.6% of the total avifauna of the State was recorded in the Sheyenne Lake area during April-June 1980.

The avifauna included 68 species that occurred exclusively as migrants, 92 species that nested, 8 that occurred as summer residents, and 7 that occurred as summer visitors. Summer residents included birds for which the Sheyenne Lake area was within their known breeding range in the State, but no positive evidence of nesting was found. In all likelihood, these species nested in the study area. Summer visitors included species which nest elsewhere in the State, but occurred on the study area as feeding adults or as non-breeding vagrants. This group included white pelican, double-crested cormorant, and Franklin's, California, and ring-billed gulls.

Stewart (1975) listed 196 species that nest, have nested, or probably nest in North Dakota. The 92 breeding species recorded in my study area represented 46.9% of the known breeding avifauna of the State. Assuming that the eight summer residents nested, the total breeding component at Sheyenne Lake was 100 species, or 51% of the State total.

Breeding Populations

Seventy-five breeding bird species were recorded on the 83 census plots in the study area. Records were obtained of an additional 25 presumed breeding species. Records of active nests (those with at least one egg or young) or dependent young, were obtained for 55 species. Most of the

25 species not recorded on census plots were either wide-ranging birds which maintain very large territories (e.g., red-tailed and Swainson's hawk) or were rare, local, or highly secretive species that are difficult to census (e.g., piping plover, yellow rail).

Among taxonomic groups, four orders made up about 95% of the total population. Passeriformes were the most numerous, contributing nearly 68% of the total. Within the Passeriformes, over 54% of the total breeding pairs were wetland or wetland-related species. Marsh nesting blackbirds were among the more numerous members of the Passeriformes. Anseriformes were second in numbers (16.1%), followed by Columbiformes (6.3%) and Charadriiformes (4.6%). Percentage composition of three of these orders was considerably different than the statewide mean. Stewart and Kantrud (1972) reported that Passeriformes made up 79.5% of the State population, Anseriformes made up 8.7%, and Columbiformes 2.4%. Only Charadriiformes were similar (3.9%). Among other orders, populations of breeding birds in the Sheyenne Lake study area were usually above the statewide means (Table 3).

Table 3. *Breeding population among major bird orders on the Sheyenne Lake Study Area, 1980. Densities are compared with statewide means described in Stewart and Kantrud (1972).*

Order	Breeding population	Density (pairs/km ²)	
		Study area	Statewide
Podicipediformes	254	3.08	^a
Ciconiformes	98	1.19	0.34
Anseriformes	3,501	42.60	12.47
Falconiformes	10	0.12	0.49
Galliformes	35	0.42	0.39
Gruiiformes	541	6.60	4.57
Charadriiformes	1,002	12.20	5.60
Columbiformes	1,371	16.67	3.50
Piciformes	73	0.88	0.67
Passeriformes	14,757	179.73	113.05

^aNo data available.

The large number and the numerical importance of the Charadriiformes nesting in the study area were considerably higher than in surrounding areas. This group includes both shorebirds and terns; the status of many species in this order has been of continent-wide concern recently (see Arbib 1978, 1979). Among the species of greatest numerical importance was the black tern. A recent analysis of North American BBS data (D. H. Johnson and C. A. Faanes, unpublished data) indicates that the black tern is declining significantly at the periphery of its breeding range, and maintaining itself only marginally in its center—the prairie pothole region of the United States and south central Canada.

Based on data collected on census plots, the total breeding population was estimated at 21,798 pairs. Thirty-six species made up about 90 % of the total breeding population in 1980 and represented 19,556 breeding pairs (Table 4). Ten species made up over 52 % of the population.

The red-winged blackbird was the most abundant breeding bird, making up over 13 % of the total breeding population. Its ubiquitous nature is reflected in its occurrence in seven of the eight major habitats censused. Red-winged blackbirds were the most abundant breeding species in prairie thickets, seasonal wetlands, and wet meadows.

The second most abundant breeding species was the yellow-headed blackbird, which made up about 8.8 % of the total population. The yellow-headed blackbird was restricted exclusively to wetlands, reaching greatest density in semipermanent wetlands. The mean density in that wetland class was more than 78 % greater than on the seasonal wetlands, which supported the next highest density. The mourning dove occurred in four major habitats; the largest densities were recorded in shelterbelts.

The species composition of breeding waterfowl in the study area was similar to that found throughout the Prairie Pothole Region. The projected population of waterfowl in 1980 was 3,501 pairs, which included 3,046 (87.0 %) dabbling duck pairs, 446 (12.7 %) diving duck pairs, and nine (0.3 %) Canada goose pairs (Table 5).

Breeding waterfowl populations at the Sheyenne Lake Study Area were considerably greater than the means for both the physiographic region and the State. I attribute these differences to the presence of high-quality semi-permanent and seasonal wetlands and the climatic conditions in 1980. During April and May the proportion of seasonal wetlands containing surface water declined from about 35 to 18 %, but rebounded to about 30 % following June rains. Semipermanent and permanent wetlands contained water throughout the breeding season and were used extensively by waterfowl. In areas adjacent to Sheyenne Lake, water conditions were similar.

Although based on only 1 year of data, available records suggest that during dry years such as 1980, natural wetlands in the Sheyenne Lake Study Area may be serving as an important "refuge." The high-quality wetlands present in the study area may be serving to attract and maintain breeding pairs from the surrounding area during poor water years.

Habitat Distribution of Breeding Birds

Among the 36 major breeding species recorded, the breakdown of overall habitat affinities includes 18 species (50 %) which are primarily wetland related, 6 (17 %) which occurred primarily in shelterbelts, 5 (14 %) were prairie species, 4 (11 %) occurred primarily in prairie thickets, 2 (5 %) were rather ubiquitous in habitat selection, and 1 (3 %) was a cropland species.

Table 4. *Population estimates of major bird species on the Sheyenne Lake Study Area, in 1980, compared with statewide means described in Stewart and Kantrud (1972).*

Species	Population estimate and HPD ^a interval	Density (pairs/km ²)	
		Study area	Statewide
Red-winged blackbird	2,855 (1,963-3,747)	34.77	11.44
Yellow-headed blackbird	1,904 (1,194-2,615)	23.19	1.11
Mourning dove	1,371 (897-1,845)	16.69	3.50
Blue-winged teal	1,052 (369-1,736)	12.48	3.72
Brown-headed cowbird	845 (552-1,138)	10.29	5.47
Horned lark	812 (613-1,011)	9.89	14.90
Clay-colored sparrow	645 (414-875)	7.85	4.34
Gadwall	636 (213-1,057)	7.75	1.19
Grasshopper sparrow	616 (388-844)	7.50	3.51
Chestnut-collared longspur	599 (369-830)	7.29	13.44
Mallard	594 (323-867)	7.23	2.59
Western kingbird	572 (199-946)	6.96	1.22
Eastern kingbird	529 (367-692)	6.44	1.94
Common yellow-throat	436 (272-599)	5.31	1.60
Western meadowlark	414 (343-485)	5.04	10.97
Savannah sparrow	395 (264-526)	4.81	6.23
Long-billed marsh wren	373 (152-595)	4.54	b
Yellow warbler	359 (173-546)	4.37	1.32
Brown thrasher	355 (91-619)	4.32	0.49
Northern shoveler	353 (93-613)	4.30	b
Pintail	330 (175-485)	4.02	2.09
Black tern	314 (0-609)	3.82	1.48
Bobolink	312 (152-471)	3.80	2.57
Common grackle	305 (49-562)	3.71	1.86
American goldfinch	299 (122-475)	3.64	1.28
Sora	298 (181-416)	3.62	0.35
Lark bunting	247 (57-436)	3.00	7.21
Killdeer	234 (114-355)	2.85	1.25
Song sparrow	233 (150-317)	2.83	0.65
American coot	225 (65-386)	2.74	4.18
Ruddy duck	188 (26-349)	2.29	b
Wilson's phalarope	186 (0-386)	2.26	0.94
Barn swallow	177 (73-280)	2.15	1.17
Gray catbird	174 (0-351)	2.12	0.58
Least flycatcher	165 (28-300)	2.00	b
Willow flycatcher	154 (95-213)	1.87	0.34

^aHighest probability density.

^bNo data available.

Seasonal Wetlands

The second highest mean breeding bird density on wetlands occurred in seasonal basins, but these wetlands supported the lowest total population of all freshwater

Table 5. *Population characteristics of breeding waterfowl at the Sheyenne Lake Study Area, 1980.*

Species	Study area		Mean (pairs/km ²) ^a	
	Projected population	Density (pairs/km ²)	Statewide	Physiographic region
Dabblers				
Mallard	594	7.23	2.8	2.1
Gadwall	636	7.74	1.9	1.6
Pintail	330	4.01	2.8	2.9
American wigeon	10	0.11	0.3	0.5
Green-winged teal	71	0.86	0.7	0.9
Blue-winged teal	1,052	12.8	5.3	2.6
Northern shoveler	353	4.29	1.5	1.4
Subtotal	3,046	34.04	15.3	12.0
Diving ducks				
Redhead	141	1.71	0.7	0.5
Canvasback	77	0.93	0.2	0.04
Lesser scaup	27	0.32	0.1	0.07
Ring-necked duck	13	0.16	0.07	0.04
Ruddy duck	188	2.29	0.6	0.5
Subtotal	446	5.41	1.67	1.15
Canada goose	9	0.11	b	b
Grand total	3,501	42.56	16.97	13.15

^aAfter Stewart and Kantrud (1974)^bNo data available.

habitats. Red-winged and yellow-headed blackbirds were the two most abundant species in seasonal wetlands, making up about 46.6% of the total population. Six species accounted for 65% of the species abundance: the two blackbirds, blue-winged teal, northern shoveler, pintail, and brown-headed cowbird. Waterfowl were represented by six species which made up about 24% of the population.

Stewart and Kantrud (1973) found that the best environmental conditions for breeding dabbling ducks

Table 6. *Ecological distribution of breeding waterfowl at the Sheyenne Lake Study Area, 1980.*

Wetland class	No. of species	No. of breeding pairs	Percent of total breeding pairs	Statewide mean percent ^a
Seasonal	6	364	10.4	42
Semi-permanent	8	923	26.4	27
Permanent	13	1,551	44.3	3
Alkali	10	663	18.9	<0.5
Totals		3,501	100.0	

^aStewart and Kantrud 1973.

occurred when large numbers of seasonal wetlands contained surface water. Because of drought conditions prevalent in 1980, seasonal wetlands were not sufficiently wet to attract most breeding bird species. During late May when most waterfowl were nesting, only 18% of the seasonal wetlands contained surface water. The proportion of waterfowl occupying seasonal and permanent wetlands (Table 6) was almost exactly the reverse of the pattern described by Stewart and Kantrud (1973).

Stoudt (1971) reported that when water conditions were optimal, most breeding waterfowl occupied wetlands that were not permanent. However, Jessen et al. (1964) found higher percentages of breeding waterfowl in more permanent wetlands regardless of wetland conditions in the prairie pothole region in Minnesota.

Semipermanent Wetlands

Semipermanent wetlands supported the second highest density of breeding birds and the third highest total breeding population (Table 7). The yellow-headed blackbird was the dominant breeding species, accounting for nearly one-third of the population. The yellow-headed and red-winged blackbirds made up about 48% of the breeding birds occupying semipermanent wetlands. Other species

Table 7. *Characteristics of breeding bird populations in the major habitat types, Sheyenne Lake Study Area, 1980.*

Habitat	Species richness	Mean density (pairs/km ²)	Estimated breeding bird population	Species diversity (H')	Species equitability (J')
Shelterbelt	24	2,658.7	4,521	3.7498	0.8178
Semipermanent wetland	22	1,357.8	3,393	3.4142	0.7656
Prairie thicket	19	878.5	2,089	3.5839	0.8436
Seasonal wetland	25	574.0	1,279	3.4750	0.7483
Permanent wetland	36	527.4	3,683	4.2761	0.8270
Alkali wetland	17	450.8	937	3.3297	0.8146
Wet meadow	19	319.7	1,832	3.1988	0.7530
Upland native prairie	20	142.2	2,763	3.3695	0.7796
Cropland	13	33.6	1,301	2.2607	0.6109

represented by 100 or more breeding pairs, in decreasing order of abundance, were blue-winged teal, gadwall, mallard, long-billed marsh wren, sora, common yellow-throat, and American coot.

Most investigations of breeding birds in wetlands have dealt with waterfowl and few data are available for non-anatid species. Weber (1978) found that highest breeding densities of both yellow-headed and red-winged blackbirds occurred in semipermanent and permanent wetlands. He reported that for both species, highest breeding densities were positively correlated with area of surface water and type of vegetative cover. Thus, large water bodies with an interspersed emergent aquatic plant species were heavily used by both species. Weller and Spatcher (1965) found that the greatest density and diversity of marsh birds were associated with seasonal and semipermanent wetlands which provided a variety of vegetative life forms.

The total density of breeding birds occupying semipermanent wetlands in my study area was 1,358 pairs/km.² Knodel (1979) censused four semipermanent and permanent fresh wetlands in McLean County, North Dakota, and found a maximum density of 390 pairs/km.²; on one wetland, the yellow-headed blackbird made up 47.5% of the total density. Krapu and Green (1978) found 13 species on one semipermanent wetland; maximum density was 2,168 pairs/km.² Of the four wetlands they censused, the yellow-headed blackbird was the most abundant species in each.

Permanent Wetlands

Permanent wetlands occupied the largest area among freshwater basin wetlands, and had the highest number of species, but supported the lowest density of breeding birds in fresh wetlands. The blue-winged teal was most abundant, accounting for 13.7% of the population. Eleven species made up 75% of the breeding population in permanent wetlands. These species, in decreasing order were blue-winged teal, red-winged blackbird, yellow-headed blackbird, mallard, black tern, gadwall, long-billed marsh wren, killdeer, eared grebe, pintail, and red-head. Waterfowl were represented by 13 species and made up about 42% of the population. Permanent wetlands were also occupied extensively by colonial and semi-colonial water birds, particularly western, horned, and eared grebes, black-crowned night heron, and black tern.

Avian use of permanent wetlands on the study area, particularly by waterfowl, was considerably different from previous observations. Dwyer et al. (1979) reported that breeding female mallards used permanent wetlands the least of the five main wetland classes available. Kantrud and Stewart (1977) found that permanent wetlands were used by all major breeding waterfowl species in North Dakota, but that only the lesser scaup reached its maximum breeding density on these wetlands. H. A. Kantrud (unpublished data) recorded 13 of 22 non-anatid

breeding bird species on permanent wetlands, but only the western grebe attained its maximum density on this wetland class.

Available data suggest that permanent wetlands showed a high degree of use by breeding birds but their importance for avian production, particularly by waterfowl, can be argued. Because of the relatively constant water depth and low amount of nutrient cycling on permanent wetlands, food productivity is limited. G. A. Swanson (personal communication) has noted that invertebrate productivity and use by breeding birds in permanent wetlands occur only when mudflats are exposed or water levels are reduced during periods of extreme drought. Krapu and Duebbert (1974) reported that periodic drawdowns of surface water and periodic drying periods were important in contributing to the high degree of productivity in a large marsh in southeastern North Dakota. These conditions do not regularly occur on permanent wetlands; therefore, the high densities and diversity of breeding birds I observed are probably masking the actual lesser importance of these large wetlands to avian production.

Alkali Wetlands

Alkali wetlands supported the lowest total breeding population of all habitats (Table 7). Species richness was second lowest; only cropland supported fewer species. The gadwall was the most abundant breeding species, contributing about 24% of the total. Six species made up 76% of the breeding population on alkali wetlands. These species, in decreasing order of abundance, were gadwall, northern shoveler, pintail, Wilson's phalarope, mallard, and blue-winged teal. Waterfowl were represented by 10 species and made up of about 69.9% of total abundance. Shorebirds were the second most numerous group of breeding birds, accounting for 27% of the population. Most abundant among these were Wilson's phalarope, American avocet, killdeer, and spotted sandpiper.

I found nine species that reached their maximum breeding densities in the Sheyenne Lake area on alkali wetlands. The American avocet and spotted sandpiper were restricted exclusively to these wetlands. H. A. Kantrud (unpublished data) found nine non-anatid species occupying alkali wetlands throughout North Dakota; the American avocet and piping plover reached their maximum density on these wetlands. Although of lesser importance to most breeding birds, alkali lakes were extremely important as feeding and resting areas for both migrant shorebirds and for waterfowl that nested on nearby wetlands.

Wet Meadows

Breeding bird populations in wet meadows were the second lowest among all wetland classes (Table 7). The red-winged blackbird was the most abundant species, making up 31.9% of the total population. Five species

made up about 75% of the species abundance in wet meadows; in order of decreasing abundance, they were the red-winged blackbird, savannah sparrow, bobolink, yellow-headed blackbird, and brown-headed cowbird. Blackbirds and sparrows were the most numerous groups of breeding birds; each was represented by five species. About 62.5% of total abundance was attributed to blackbirds and 29.6% to sparrows. Le Conte's sparrow was restricted to this habitat and seven other species reached their highest density in wet meadows.

Because of its relative unimportance to breeding waterfowl, wet meadow habitat has received very little attention in the Northern Great Plains. However, its use by breeding songbirds in the Sheyenne Lake area suggests that additional study should be placed on this wetland class. I found 19 species occupying wet meadows in 1980, and 8 of these reached their maximum densities in these wetlands. H. A. Kantrud (unpublished data) found that of 22 selected non-anatid species, 4 (killdeer, marbled godwit, red-winged blackbird, savannah sparrow) reached their maximum densities in these wetlands. Stewart (1975) listed 11 species (red-winged blackbird, savannah sparrow, marsh hawk, short-eared owl, Wilson's phalarope, short-billed marsh wren, Sprague's pipit, common yellowthroat, bobolink, western meadowlark, and Le Conte's sparrow) as primary and secondary indicators of wet meadow habitat.

Use of these wetlands by Le Conte's sparrow is well known (Southern 1962; Murray 1969; Faanes 1981). The density of Le Conte's sparrow that I encountered is probably among the greatest known for this species. The mean density in wet meadows throughout the study area was 15 pairs/km², and on one plot I recorded 43 pairs/km². Bobolink and savannah sparrow occupied other habitats, primarily the drier portions of seasonal wetlands, and low, wet areas in upland native prairie. The density of bobolinks in wet meadows was 19% greater than in seasonal wetlands and 98% greater than in native prairie. Savannah sparrow densities in wet meadows were 95% greater than in seasonal wetlands and 94% greater than in native prairie.

The extensive use of wet meadows by "typical" upland native prairie species such as Baird's sparrow and Sprague's pipit was related to drought conditions. Stewart (1975) listed Baird's sparrow as a primary indicator of the eastern mixed-grass prairie in North Dakota and Sprague's pipit as a secondary indicator. In 1980, the density of Baird's sparrow in wet meadows was about 55% greater than in upland native prairie. Baird's sparrow is known to shift habitat use from native prairie to wetland habitats during dry periods (Kantrud and Faanes 1979), and Sprague's pipit is suspected of doing so. I believe that both species shifted habitat use to wet meadows in 1980 because of extremely dry conditions in the native upland habitat. R. E. Stewart (personal communication) reported that both Sprague's pipit and sharp-tailed sparrow reach maximum breeding density in North Dakota during

drought periods when their primary habitat use is wet meadows.

Prairie Thickets

Prairie thickets were rather limited, but supported the third highest mean breeding density of all habitats (Table 7). The red-winged blackbird was the most abundant species, accounting for 22.9% of total abundance. Seven species made up about 75% of the total population: in order of decreasing abundance, the red-winged blackbird, yellow warbler, clay-colored sparrow, common yellowthroat, willow flycatcher, song sparrow, and brown-headed cowbird. Blackbirds were the most numerous family, contributing 31.7% of the total abundance, and warblers were second at 21.1%. Six species reached their maximum density in prairie thickets, and two (American kestrel, willow flycatcher) were recorded only in this habitat.

Prairie thickets are largely restricted to grassland areas in the Prairie Pothole and in the Southwestern Slope regions of North Dakota (Stewart 1975). Those which are best developed in central North Dakota occur primarily along the eastern edge of the Missouri Coteau in isolated coulees that frequently serve as the watershed for intermittent streams. Because of the geologic origin of soils underlying prairie thickets, resultant vegetative growth can take characteristics of wet meadow, native prairie, and woodland communities. The predominant vegetative feature is the presence of a well-developed stand of various shrubs or small trees.

The density of breeding birds, species richness, and species diversity in prairie thickets were probably related to the presence of several microhabitats. Because the equitability component is highest when all species in the sample are as nearly equal in the population as possible (Kricher 1972), the equitability statistic obtained would indicate that no individual species was particularly dominant in prairie thickets. I found that nearly 75% of the population was accounted for by 37% of the species. An additional seven species made up the next 22% of the total. In most other major habitats, a smaller proportion of the species accounted for a larger proportion of the population. With the clumped arrangement of similar seral stages, nesting birds that are primarily components of each microhabitat in the prairie thicket are probably able to reach maximum densities without excluding other species, as may occur in simpler habitats such as grasslands. Therefore, this component of evenness in the prairie thicket is operating to allow the maximum number of species to use prairie thickets at the expense of very few.

Native Prairie

Native prairie supported the second highest breeding density of birds in upland habitats, but the second lowest density of all habitats combined (Table 7). About 12.8% of all breeding birds in the study area occupied native

prairie. The chestnut-collared longspur was the most abundant species, contributing 21.7% of total abundance. Six species made up about 78% of the population including the longspur, grasshopper sparrow, clay-colored sparrow, western meadowlark, lark bunting, and horned lark. Sparrows were the most numerous family, making up 68% of total abundance. The Icterids were second in abundance; four species contributed 20.4% of the total population. Five species reached maximum density in native prairie, and three (sharp-tailed grouse, chestnut-collared longspur, lark bunting) were restricted exclusively to this habitat.

Species diversity in native prairie (Table 7) was among the lowest in the study area, and followed the general trend described by Tramer (1969). The diversity value was related to the rather simple physiognomic form of prairie grasslands, i.e., the lack of vegetative "layers" as is evident in structurally more complex habitats such as woodlands. The equitability index was in the middle of the nine major habitats, and probably reflected the rather uniform breeding populations of most prairie nesting species in the area.

Stewart (1975) listed 11 breeding bird species which he considered primary indicators of the eastern mixed-grass prairie. Of these, 10 were recorded on native prairie census plots and made up nearly 80% of total abundance. Native grasslands in the study area maintained an interspersed of species that are indicative of several grassland types. Species such as bobolink and savannah sparrow are typical primarily of eastern tallgrass prairie. Baird's sparrow, Sprague's pipit, and clay-colored sparrow are indicators of the central mixed-grass prairie, and the horned lark and chestnut-collared longspur are indicative of drier western shortgrass prairie. The predominance of the chestnut-collared longspur on the study area is similar to general conditions on native grasslands across most of the Northern Great Plains. Stewart and Kantrud (1972) found that the chestnut-collared longspur was the second most abundant breeding bird in North Dakota and made up about 9.5% of the State's breeding avifauna.

Breeding birds occupying native prairie included species that reached maximum densities under different grazing intensities and moisture conditions. Among the six most numerous species occupying native prairie, two (chestnut-collared longspur, horned lark) reached maximum densities in moderately to heavily grazed prairie, two (grasshopper sparrow, lark bunting) reached maximum densities under moderate to light grazing conditions, the western meadowlark occurred on grasslands under several grazing conditions, and the clay-colored sparrow inhabited primarily clumps of low shrubs, usually wolfberry.

The drought that prevailed in 1980 appeared to affect the annual growth of prairie grasses. Vegetation on many grassland areas that had previously been overgrazed grew very slowly during the growing season. Several species which are considered characteristic of vegetation that is

lightly to moderately grazed (e.g., Baird's sparrow, Sprague's pipit), contributed very little to total abundance. Those which are more tolerant of shorter herbage characteristic of heavily grazed areas, reached high levels.

Shelterbelts

The highest density of breeding birds and the largest population occurred in shelterbelts. Twenty-four species were recorded on the breeding bird census plots in shelterbelts. Eight species made up 74.6% of the population: mourning dove, western kingbird, eastern kingbird, brown thrasher, common grackle, brown-headed cowbird, American goldfinch, and least flycatcher. The mourning dove, family Columbidae, was the most abundant species, accounting for 27.1% of total abundance. Tyrannidae (three species) was the second most abundant family, and accounted for 24.6% of the population. Icteridae (five species) was third in abundance with 19.0%. Eighteen species reached maximum densities in shelterbelts. Seven species (common flicker, house wren, loggerhead shrike, warbling vireo, house sparrow, orchard oriole, northern oriole) were recorded only in this habitat type.

Total breeding density in shelterbelts on the study area was 2,659 pairs/km². Yahner (1980a, 1980b, 1980c, 1980d) reported slightly higher densities in four mature Minnesota shelterbelts, ranging from 3,437 to 9,793 pairs/km². Common grackles and mourning doves were the most abundant breeding birds in this area; largest densities were 8,412 and 709 pairs/km². Ressel (1973a, 1973b, 1973c, 1973d) reported slightly lower densities ranging from 699 to 2,136 pairs/km² in mature eastern North Dakota shelterbelts; mourning dove, yellow warbler, and American robin were the three most abundant species. Species richness in Ressel's study areas ranged from 4 to 14 species. H. A. Kantrud (unpublished data) found that breeding densities in several central North Dakota shelterbelts and single-row windbreaks averaged 803 pairs/km². Species composition in Kantrud's area included 33 species.

The number of breeding bird species occupying shelterbelts was the largest of all upland habitats. Species diversity and equitability in shelterbelts were among the largest of all major habitats. The diversity index is closely related to species richness, but equitability is regulated by the numbers of individuals of one or more species that are the dominant components of the habitat. Although a large number of species occupied shelterbelts, only two species accounted for nearly 40% of the total density. This dominance was reflected in the high equitability index.

Cropland

Agricultural fields in various types of crop production made up over 47% of the study area, but only 5.9% of the breeding bird population occupied croplands. There were

13 species recorded in this habitat during the nesting season, and 10 of these probably nested there. The horned lark, which nested in wheat stubble fields and fallow fields, was the most abundant breeding species, contributing 51.7% of total abundance. Three species made up nearly 78% of the breeding population in cropland. Those in second and third place were red-winged blackbird, which nested in alfalfa fields, and vesper sparrow, which occupied the edges of various fields. Three species reached their maximum density in cropland, and the gray partridge occurred only in this habitat type.

Breeding bird populations in cropland were the lowest of all major habitats studied in 1980. Wheat, sunflower, and fallow fields constituted most of the land use. Little alfalfa was grown in the study area, and only one alfalfa field was included in the random selection of census plots. Of all crop fields investigated, bird populations were highest in alfalfa. The breeding density in croplands in the study area was 34 pairs/km². Carlisle (1975) reported that five species with a density of 316 pairs/km² occupied a Dunn County, North Dakota, alfalfa field. In Illinois, Graber and Graber (1963) reported that mean breeding bird densities in alfalfa ranged from 543 to 1,153 birds/km² in 1957. Red-winged blackbirds were the most numerous breeding bird in Illinois alfalfa fields, making up almost 36% of total density.

The depauperate nature of breeding bird populations in cropland is demonstrated by the low species richness, mean densities, species diversity, and the equitability index that I observed (Table 7). In all instances the figures for cropland were the lowest in the study area.

Conclusion

The habitats proposed for inundation by the Lonetree Reservoir are among the most unique and diverse in North Dakota. Densities of many breeding bird species in this area equal or exceed statewide means. This finding, I believe, was related to the close interspersed of habitat types, the floristic composition, and the area's geographic setting. Because of its location, the breeding avifauna demonstrates a mixture of eastern, central, and western prairie species. About 24% of the study area was upland native prairie, which supported about 13% of the breeding birds. General use of lands surrounding the study area was predominantly for cereal grain or sunflower production. Thus, the existing grasslands appeared to be islands of native vegetation surrounded by altered habitats. Such diverse wetland-prairie complexes are rapidly disappearing from the landscape of North Dakota as agricultural production intensifies.

Breeding waterfowl populations generally exceeded statewide means in response to the numerous high-quality wetlands of several classes. If overall wetland conditions had been more favorable and seasonal wetlands had held water longer, breeding densities of dabbling ducks would

probably have been higher. Nonetheless, the quality and density of wetlands was apparently sufficient during a drought to attract and maintain an exceptionally high density of waterfowl.

The Sheyenne River is an international resource because it is a tributary of the Red River of the North which flows into Canada. The study area was at the headwaters of the river, one of the largest and most important prairie streams in the State. Extensive areas of wet meadows have formed in the seepage areas associated with the River. In North Dakota, wet meadows form as isolated zones on the periphery of larger wetlands. Large expansive wet meadows, such as those at Sheyenne Lake, are rare and localized across the State. Breeding birds associated with wet meadows, particularly yellow rail, Le Conte's sparrow, and sharp-tailed sparrow, form a unique component of the State's avifauna.

The alkali lakes in the study area were not used extensively by breeding birds. The value of these wetlands was best demonstrated from their use by migrants. During late April, flocks of 30-50 whistling swans were frequently observed feeding and resting on alkali wetlands; their use of other wetlands was virtually non-existent. During late May, 29 shorebird species were observed in the study area. Of these, 17 species either reached maximum numbers or were restricted exclusively to alkali wetlands. Over 3,000 shorebirds were observed on one alkali wetland on 22 May, of which over 2,200 were northern phalaropes. Large mixed-species flocks of waterfowl were frequently observed feeding on alkali wetlands throughout May and June.

Among the other unique habitats of the area are the prairie thickets which formed along intermittent streams at the base of the Missouri Coteau escarpment. Breeding bird diversity and densities in prairie thickets were among the highest of all natural habitats studied. I found Lonetree Lake and the extensive marshes on the upper Sheyenne River to be very important for nesting and brood rearing among most marsh birds; the areas were also used extensively by molting waterfowl.

The single most diverse area investigated was a 31.6-ha semipermanent wetland in Secs. 17 and 20, T. 149 N., R. 75 W. The avifaunal diversity and abundance rivals the number of bird species using wetland vegetation at Kraft Slough in Sargent County, North Dakota (Krapu and Duebbert 1974). I recorded 29 species on this wetland during the breeding season, which represented nearly one-third of the total breeding avifauna of the study area. Present on the wetland were large numbers of breeding black and Forster's terns; both species are declining over most of their range. Numerous colonial water birds bred on the wetland or in its surrounding vegetation. Most important among these were four grebe species and black-crowned night heron. The wetland was used extensively by waterfowl and American coots. Over 200 male canvasbacks were observed there on 25 June, as well as numerous broods of most duck species.

Annotated Species Accounts

In the following annotated list, the taxonomic order follows that of the AOU check-list (1957), except that the arrangement of shorebird species follows Jehl (1968). Current accepted nomenclature follows the check-list, as amended (AOU 1973, 1976). The status of 175 species recorded in the study area is briefly summarized. Maximum counts, dates of observation, limited data on clutch or brood size, and habitat occupancy are included. Population estimates of breeding birds not provided in Table 5 are presented here. Several observations by Audubon National Wildlife Refuge personnel are provided. All dates are 1980, except as specifically indicated.

FAMILY GAVIIDAE

Common Loon (*Gavia immer*): A pair was observed on Coal Mine Lake on 22 May. This species is rare and irregular during migration in central North Dakota, although it is fairly common in northeastern North Dakota, particularly in the Turtle Mountains.

FAMILY PODICIPEDIDAE

Horned Grebe (*Podiceps auritus*): Fairly common migrant and rare nesting species. Most breeding pairs occupied large semipermanent and permanent wetlands. The nesting population was estimated at 15 pairs.

Eared Grebe (*Podiceps nigricollis*): Fairly common nesting species, generally distributed on all wetland classes. Largest breeding densities occurred on permanent wetlands. The breeding population was estimated at 144 pairs.

Western Grebe (*Aechmophorus occidentalis*): Common migrant and an uncommon and local nesting species. This species was restricted primarily to large permanent wetlands that were slightly to moderately brackish. At least three nesting colonies were active in 1980; the largest was located in T. 149 N., R. 74 W. and contained 34 nests.

Pied-billed Grebe (*Podilymbus podiceps*): Fairly common nesting species, occupying all wetland classes. Largest breeding densities occurred on semipermanent wetlands. The breeding population was estimated at 91 pairs.

FAMILY PELECANIDAE

White Pelican (*Pelecanus erythrorhynchos*): Fairly common migrant and summer visitor. Flocks of 6–18 individuals regularly foraged on Lonetree and Sheyenne lakes, and a large semipermanent wetland in Secs. 17 and 20, T. 149 N., R. 75 W. The source of these pelicans was probably the colony on Chase Lake National Wildlife Refuge, located about 100 km southeast of the study area.

FAMILY PHALACROCORACIDAE

Double-crested Cormorant (*Phalacrocorax auritus*): Fairly common migrant and summer visitor, most frequently encountered on large semipermanent wetlands. Groups consisting of 6–10 birds were regularly encountered on larger wetlands during May. On 25 June, a flock of 37 was observed feeding on a 24.7-ha permanent wetland in Sec. 35, T. 150 N., R. 76 W.

FAMILY ARDEIDAE

Great Blue Heron (*Ardea herodias*): Occasional summer visitor. Single birds were observed foraging along the edge of seasonal and semipermanent wetlands.

Black-crowned Night Heron (*Nycticorax nycticorax*): Fairly common migrant and nesting species. Largest nesting densities occurred in the dense emergent vegetation along the periphery of semipermanent wetlands. At least six nesting groups containing 38 pairs were located. Regularly found foraging along the edge of seasonal wetlands during June. The breeding population for the study area was estimated at 74 pairs.

American Bittern (*Botaurus lentiginosus*): Rare nesting species; first recorded on 21 April in emergent vegetation along the Sheyenne River. During the nesting season, most frequently encountered in semipermanent wetlands. One nest containing three young was found in a wet meadow in Sec. 20, T. 149 N., R. 75 W. The breeding population was estimated at 24 pairs.

FAMILY ANATIDAE

Whistling Swan (*Olor columbianus*): Fairly common migrant. Flocks of 30–50 whistling swans were regularly encountered on moderately brackish to subsaline semipermanent and permanent wetlands during April.

Canada Goose (*Branta canadensis*): Fairly common migrant; rare and local nesting species. One hundred Canada geese were observed on Sheyenne Lake on 10 October 1974 (Audubon National Wildlife Refuge, manager files). Nesting pairs were apparently restricted to large permanent wetlands. A pair and brood of three were observed on Coal Mine Lake (Sec. 32, T. 149 N., R. 74 W.) on 27 June. The breeding population was estimated at nine pairs. Canada geese on the study area were apparently the giant subspecies (*B. c. maxima*), and probably represented birds that have pioneered from recent releases by both the State Game and Fish Department and the Fish and Wildlife Service.

White-fronted Goose (*Anser albifrons*): Flocks of 16, 27, and 54 were observed flying north over the study area on

25 April. Five white-fronted geese were observed on Sheyenne Lake on 30 April 1976 (Audubon National Wildlife Refuge, manager files).

Snow Goose (*Chen caerulescens*): A flock of 68 was recorded on 18 April flying over Sheyenne Lake. This species occurs abundantly during migration throughout eastern and central North Dakota, and its status is expected to be similar on the study area.

Mallard (*Anas platyrhynchos*): Common migrant and nesting species. Mallards occupied all available wetland classes during 1980. Highest densities were associated with semipermanent wetlands. At least 11 broods occupied Lonetree Lake (Sec. 7, T. 148 N., R. 74 W.) on 26 June.

Gadwall (*Anas strepera*): Common migrant and nesting species. Highest densities occurred on brackish or alkali wetlands. Most broods were encountered on wetlands of similar water chemistry. On 22 May, 290 gadwalls were observed on a 11.5-ha alkali wetland in Sec. 8, T. 149 N., R. 75 W.

Pintail (*Anas acuta*): Abundant migrant and fairly common nesting species. Highest densities occurred on brackish semipermanent wetlands. On 25 June, an estimated 2,700 molting pintails were found in a marshy portion of the Sheyenne River in Sec. 21, T. 149 N., R. 75 W.

Green-winged Teal (*Anas crecca*): Uncommon migrant and nesting species. Breeding pairs were most frequently encountered on semipermanent wetlands. The breeding population was estimated at 71 pairs.

Blue-winged Teal (*Anas discors*): Abundant migrant and common nesting species. Breeding pairs and migrants occupied virtually all wetland classes in the study area, although most breeding pairs occurred on permanent wetlands.

American Wigeon (*Anas americana*): Uncommon migrant, rare and local during the nesting season. Most frequently encountered on moderately brackish permanent wetlands. The breeding population was estimated at 10 pairs.

Northern Shoveler (*Anas clypeata*): Fairly common migrant and nesting species. Most breeding pairs occupied either fresh semipermanent wetlands or saline permanent wetlands.

Redhead (*Aythya americana*): Fairly common migrant and nesting species. Breeding pairs were restricted primarily to semipermanent wetlands. On 24 June, 17 females and four nests were found in a 31.6-ha semipermanent wetland in Secs. 17 and 20, T. 149 N., R. 75 W. The breeding population was estimated at 144 pairs.

Canvasback (*Aythya valisineria*): Fairly common migrant and uncommon nesting species. Migrants and breeding pairs occupied semipermanent and permanent wetlands. On 25 June, a group of 200 male canvasbacks was observed on a 31.6-ha semipermanent wetland in Secs. 17 and 20, T. 149 N., R. 75 W. The breeding population was estimated at 77 pairs.

Ring-necked Duck (*Aythya collaris*): Rare migrant and nesting species, occurring primarily on permanent wetlands. The breeding population was estimated at 13 pairs.

Lesser Scaup (*Aythya affinis*): Common migrant and rare nesting species. Migrants occupied virtually all wetland classes although an apparent preference was shown for permanent wetlands. Nesting pairs were found only on permanent wetlands. The nesting population was estimated at 27 pairs.

Common Goldeneye (*Bucephala clangula*): Flocks of 13 and 8 were observed on Coal Mine Lake on 17 April. Fifteen common goldeneyes were observed on Sheyenne Lake on 12 May 1975 (Audubon National Wildlife Refuge, manager files).

Bufflehead (*Bucephala albeola*): Fairly common migrant, occupying both semipermanent and permanent wetlands.

Ruddy Duck (*Oxyura jamaicensis*): Fairly common migrant and nesting species. All nesting pairs observed occupied semipermanent wetlands.

Hooded Merganser (*Lophodytes cucullatus*): Two were observed on Lonetree Lake on 22 April.

Common Merganser (*Mergus merganser*): Two were observed on Coal Mine Lake on 23 April.

FAMILY ACCIPITRIDAE

Red-tailed Hawk (*Buteo jamaicensis*): Rare nesting species. One nest containing two fully feathered young was found in Sec. 3, T. 148 N., R. 74 W., on 24 June. The breeding population was estimated at two pairs; both were found associated with shelterbelts and adjacent native prairie.

Swainson's Hawk (*Buteo swainsoni*): The nesting population was estimated at four pairs. One nest containing two young was found in a shelterbelt in Sec. 10, T. 148 N., R. 74 W. Most nesting pairs were associated with shelterbelts and adjacent cropland or upland prairie.

Rough-legged Hawk (*Buteo lagopus*): One was observed on 17 April flying over upland native prairie.

Ferruginous Hawk (*Buteo regalis*): Uncommon nesting

species. The breeding population was estimated at two pairs which were regularly observed hunting over upland native prairie.

Marsh Hawk (*Circus cyaneus*): Only one nesting pair was known to occupy the study area in 1980. This pair was found regularly during late June in a large wet meadow in Sec. 21, T. 149 N., R. 75 W.

FAMILY FALCONIDAE

Peregrine Falcon (*Falco peregrinus*): One adult, probably a female, was observed 21 May, hunting over a mudflat along the Sheyenne River in Sec. 26, T. 149 N., R. 75 W.

American Kestrel (*Falco sparverius*): Fairly common migrant and rare nesting species. One pair was found in a prairie thicket in Sec. 16, T. 148 N., R. 74 W. on 23 June. Another nesting pair was found in a grove of cottonwoods near an abandoned farmsite in Sec. 16, T. 148 N., R. 74 W. The breeding population in the study area was estimated at 10 pairs.

FAMILY TETRAONIDAE

Sharp-tailed Grouse (*Pedioecetes phasianellus*): Uncommon permanent resident. On 23 April, a grouse dancing-ground occupied by 30 males was found in Sec. 19, T. 149 N., R. 75 W. Another ground occupied by 12 males in Sec. 25, T. 149 N., R. 75 W. was found by M. R. McEnroe on 16 April. Two broods, one containing six, the other four, were found in upland prairie on 25 June. The study area breeding population was estimated at 12 pairs.

FAMILY PHASIANIDAE

Gray Partridge (*Perdix perdix*): Probably an uncommon permanent resident. One adult with a brood of 11 was found in Sec. 28, T. 149 N., R. 74 W. on 24 June. This group was occupying the edge of a roadside and a wheat stubble field. A pair without a brood was found the same day in Sec. 4, T. 148 N., R. 74 W. Because of its secretive habits during the nesting season, this species is probably more common in the study area than available records suggest. The breeding population was estimated at 23 pairs.

FAMILY GRUIIDAE

Sandhill Crane (*Grus canadensis*): Flocks of 17 and 44 were observed flying over Lonetree Lake and another flock of 39 was seen over Sheyenne Lake on 23 April. The study area is within 80 km of the Turtle Lake, North Dakota region which typically supports several thousand cranes during the migration periods. Thus, with increased

observer intensity, the Sheyenne Lake region may be found to support larger numbers of sandhill cranes.

FAMILY RALLIDAE

Virginia Rail (*Rallus limicola*): Rare nesting species. The estimated breeding population of 18 pairs was restricted almost exclusively to dense emergent vegetation associated with permanent wetlands.

Sora (*Porzana carolina*): Fairly common nesting species. Most breeding pairs were associated with the dense emergent vegetation of semipermanent and permanent wetlands. Pairs were infrequently encountered in wet meadows.

Yellow Rail (*Coturnicops noveboracensis*): Three were heard calling in a brackish wet meadow in Sec. 5, T. 148 N., R. 74 W. on 26 June. This species is a rare migrant and nesting species throughout eastern and central North Dakota. The nearest known nesting area is in Benson County, about 65 km northeast of the study area (Stewart 1975).

American Coot (*Fulica americana*): Abundant migrant and common nesting species. Breeding pairs occupied all wetland classes except wet meadows. Most breeding pairs were found in semipermanent wetlands. Nine clutches averaging 11.0 eggs and six broods with an average of 7.3 young were found.

FAMILY RECURVIROSTRIDAE

American Avocet (*Recurvirostra americana*): Uncommon nesting species, restricted in the study area to alkali wetlands. The breeding population was estimated at 69 pairs. At least six broods were observed on the edge of an alkali wetland in Sec. 7, T. 149 N., R. 75 W., on 27 June.

FAMILY CHARADRIIDAE

Semipalmated Plover (*Charadrius semipalmatus*): On 22 May, 13 semipalmated plovers were found on an exposed mudflat along the Sheyenne River (Sec. 26, T. 149 N., R. 75 W.) and 11 were found on the edge of an alkali wetland in Sec. 8, T. 149 N., R. 75 W.

Piping Plover (*Charadrius melodus*): On 23 May, two pairs were observed at the edge of an alkali wetland in Sec. 7, T. 149 N., R. 75 W. An adult with a brood of four was found on an exposed mudflat in Sec. 26, T. 149 N., R. 75 W. These three pairs probably represented the total nesting population in 1980. The entire breeding population in North Dakota has been estimated to vary annually from 500 to 1,400 pairs, depending on water conditions

(H. A. Kantrud, unpublished data). This population is apparently the largest remaining in North America.

Killdeer (*Charadrius vociferus*): Common migrant and fairly common nesting species. Breeding pairs were found primarily on the exposed muddy shores of seasonal wetlands, and in fallow cropland. One nest containing four eggs was found on 22 May, and four broods, with a mean of four young, were found throughout the study area during late June.

American Golden Plover (*Pluvialis dominica*): On 23 May, 134 American golden plovers were found foraging in a dried seasonal wetland.

Black-bellied Plover (*Pluvialis squatarola*): During 21 to 23 May, flocks of 8–10 black-bellied plovers were regularly encountered along the exposed periphery of seasonal wetlands. One flock of 22 was found along the edge of an alkali wetland in Sec. 24, T. 149 N., R. 75 W.

FAMILY SCOLOPACIDAE

Hudsonian Godwit (*Limosa haemastica*): Flocks of 4 and 11 individuals were observed on the periphery of a permanent wetland in Sec. 36, T. 150 N., R. 76 W., on 19 April. On 21 May, one flock of 38 was found in the drying basin of a seasonal wetland in Sec. 33, T. 149 N., R. 75 W.

Marbled Godwit (*Limosa fedoa*): Fairly common migrant and nesting species. Breeding pairs were most frequently observed near permanent wetlands in late April. On 24 June, a female and brood of four was found in a wet meadow in Sec. 20, T. 149 N., R. 75 W. At least seven other broods containing at least one young were found during June. The breeding population was estimated at 58 pairs.

Upland Sandpiper (*Bartramia longicauda*): Fairly common nesting species. The breeding population was estimated at 60 pairs; at least 40 pairs occupied wet meadows.

Greater Yellowlegs (*Tringa melanoleucus*): Apparently a fairly common migrant. During late April, 48 greater yellowlegs were found on seasonal and permanent wetlands.

Lesser Yellowlegs (*Tringa flavipes*): Common migrant. During late April and late May, 151 lesser yellowlegs were found on the exposed muddy edges of seasonal wetlands.

Solitary Sandpiper (*Tringa solitaria*): On 22 May, five solitary sandpipers were found on the edge of a seasonal wetland.

Willet (*Catoptrophorus semipalmatus*): Most breeding pairs were found on seasonal and permanent wetlands.

The breeding population was estimated at 18 pairs.

Spotted Sandpiper (*Actitis macularia*): Uncommon and local nesting species. The breeding population was estimated at 33 pairs; primarily associated with alkali or subsaline wetlands. A nest containing four eggs was found in Sec. 24, T. 149 N., R. 75 W., on 24 June.

Ruddy Turnstone (*Arenaria interpres*): Four ruddy turnstones were observed on the edge of an alkali wetland on 22 May.

Wilson's Phalarope (*Steganopus tricolor*): Fairly common migrant and nesting species. Most breeding pairs occupied seasonal and semipermanent fresh wetlands. Five broods were found on semipermanent wetlands during late June.

Northern Phalarope (*Lobipes lobatus*): Probably an abundant migrant. On 22 May, a flock of 2,240 northern phalaropes was observed feeding on an alkali wetland in Sec. 8, T. 149 N., R. 75 W. During late May, this phalarope was very numerous on all alkali wetlands in the study area.

Common Snipe (*Gallinago gallinago*): Uncommon migrant and rare nesting species. Most common snipes were found in seasonal and permanent wetlands. The breeding population was estimated at 14 pairs.

Short-billed Dowitcher (*Limnodromus griseus*): On 21 May, three dowitchers of this species were found on a seasonal wetland. This species is a rare and irregular migrant throughout North Dakota during both spring and fall (C. A. Faanes, unpublished data).

Long-billed Dowitcher (*Limnodromus scolopaceus*): Apparently a fairly common migrant. During late May, flocks of 8–20 long-billed dowitchers were regularly encountered on alkali wetlands throughout the study area.

Red Knot (*Calidris canutus*): On 22 May, one red knot was found on an exposed mudflat in the Sheyenne River in Sec. 26, T. 149 N., R. 75 W. This is a rare and irregular migrant throughout North Dakota (C. A. Faanes, unpublished data).

Sanderling (*Calidris alba*): Probably a common spring migrant. During late May, sanderlings were regularly encountered on the periphery of most wetland types of the study area. Largest numbers occurred on alkali wetlands.

Semipalmated Sandpiper (*Calidris pusillus*): An abundant migrant during late May. Largest populations occurred on the periphery of alkali wetlands. On 22 May, 106 semipalmated sandpipers were found on one of these wetlands.

Least Sandpiper (*Calidris minutilla*): Fairly common mi-

grant. This sandpiper was regularly encountered on all wetland types during late May. Largest numbers occurred on the exposed edges of seasonal wetlands.

White-rumped Sandpiper (*Calidris fuscicollis*): Common migrant during late May. Largest numbers occupied the periphery of alkali wetlands.

Baird's Sandpiper (*Calidris bairdii*): Common migrant occupying all wetland types during late April and May. Most frequently observed on the exposed periphery of seasonal wetlands.

Pectoral Sandpiper (*Calidris melanotos*): Fairly common migrant occupying all wetland types during late April and May. Largest numbers were observed on the exposed periphery of seasonal wetlands.

Dunlin (*Calidris alpina*): Uncommon migrant in late May. The largest number of dunlins observed (19) were occupying the periphery of an alkali wetland.

Stilt Sandpiper (*Micropalma himantopus*): Fairly common migrant during late May. Most commonly observed on the exposed periphery of seasonal wetlands.

FAMILY LARIDAE

Herring Gull (*Larus argentatus*): Probably a fairly common spring migrant during late March and early April. A group of three herring gulls was found on the lower end of Coal Mine Lake on 18 April. Another group of seven was found the same day on Lonetree Lake, and 16 were observed on the Sheyenne River at the State Highway 14 bridge on 22 April.

California Gull (*Larus californicus*): Fairly common migrant and summer visitor. Most birds during the summer were observed foraging on semipermanent wetlands.

Ring-billed Gull (*Larus delawarensis*): Fairly common migrant and summer visitor. During migration, ring-billed gulls were found on semipermanent and permanent wetlands, especially on Sheyenne Lake. During the nesting season, they were found foraging on semipermanent wetlands.

Franklin's Gull (*Larus pipixcan*): Common migrant and summer visitor. During 17 to 22 April, flocks of 50 to 80 individuals were regularly encountered on large permanent wetlands. During June, groups of 10-15 were found on the Sheyenne River and Sheyenne Lake.

Bonaparte's Gull (*Larus philadelphia*): On 21 May, a flock of 17 Bonaparte's gulls was observed on Sheyenne Lake.

Forster's Tern (*Sterna forsteri*). Uncommon migrant and nesting species. During June, Forster's terns were observed at the following sites: six adults exhibiting territorial defense were observed flying over a large marsh in Sec. 22, T. 149 N., R. 75 W.; one pair on a seasonal wetland in Sec. 22, T. 149 N., R. 75 W.; one pair on an alkali wetland in Sec. 24, T. 149 N., R. 75 W.; and one pair on a moderately brackish semipermanent wetland in the same section; seven pairs and six nests were found in a loose colony on a 31.6-ha semipermanent wetland in Secs. 17 and 20, T. 149 N., R. 75 W. The total breeding population was estimated at 18 pairs. Concern has been expressed across North America about the status of this species. Forster's Tern has been given Priority status in Minnesota, and Endangered status in Wisconsin (Faanes 1981).

Common Tern (*Sterna hirundo*). Six pairs of common terns were observed on the Sheyenne River and two on Sheyenne Lake, on 23 May. One pair remained at the Sheyenne River site through at least 27 June and may have nested. This species, like the preceding, is experiencing significant population declines throughout its breeding range (Arbib 1978, 1979).

Black Tern (*Chelidonias niger*). Common migrant and nesting species. During migration, the black tern was encountered primarily on semipermanent wetlands. During the nesting season, black terns were observed in almost equal numbers on semipermanent and permanent wetlands; occasional use was made of seasonal wetlands. On 24 June, 78 adult black terns were found on a 31.6-ha semipermanent wetland in Secs. 17 and 20, T. 149 N., R. 75 W. A search revealed 16 nests on mats of floating vegetation and decaying muskrat (*Ondatra zibethica*) houses. There were five black terns in juvenile plumage swimming in the wetland on the same day. On 26 June, 28 adult and 17 immature black terns were observed foraging over an extensive marsh in the Sheyenne River in Sec. 22, T. 149 N., R. 75 W.

FAMILY COLUMBIDAE

Rock Dove (*Columba livia*): Occasional flocks were found in both abandoned and active farm buildings throughout the study area. No population data were collected.

Mourning Dove (*Zenaidura macroura*): Breeding pairs were found in shelterbelts, upland native prairie and prairie thickets; largest densities occurred in shelterbelts. Foraging birds were frequently found in wheat stubble fields during May and June. Sixteen nests were found.

FAMILY CUCULIDAE

Black-billed Cuckoo (*Coccyzus erythrophthalmus*): Uncommon nesting species, occurring in both shelterbelts

and prairie thickets. The breeding population was estimated at 78 pairs. No nests were found.

FAMILY STRIGIDAE

Great Horned Owl (*Bubo virginianus*): One was heard calling from a shelterbelt in Sec. 11, T. 148 N., R. 74 W., on 25 June. No other population data were collected.

FAMILY CAPRIMULGIDAE

Common Nighthawk (*Chordeiles minor*): Rare nesting species restricted to upland native prairie. Although no population data were collected from census plots based on extensive observations throughout the study area, the population was estimated at 10 pairs.

FAMILY ALCEDINIDAE

Belted Kingfisher (*Megaceryle alcyon*): Rare and local nesting species. Two breeding pairs were found on the north and south shores of lower Coal Mine Lake; nesting burrows were located at both sites. These were probably the only two pairs nesting in the study area in 1980. The lack of suitable exposed slopes elsewhere in the study area is probably the most important limiting factor.

FAMILY PICIDAE

Common Flicker (*Colaptes auratus*): Fairly common nesting species in shelterbelts and tree groves around farm-sites. The breeding population was estimated at 73 pairs. One nest hole was found in a shelterbelt in Sec. 11, T. 148 N., R. 74 W., on 26 June.

Yellow-bellied Sapsucker (*Sphyrapicus varius*): One migrant was observed in a shelterbelt on 22 May.

Hairy Woodpecker (*Picoides villosus*): Rare nesting species. Two pairs were found in shelterbelts on 25 June. No other population data were collected.

Downy Woodpecker (*Picoides pubescens*): Rare nesting species. On 23 June, three males were found in separate shelterbelts. One pair was found at an apparent nest hole in an abandoned farmsite on 25 June.

FAMILY TYRANNIDAE

Eastern Kingbird (*Tyrannus tyrannus*): Common nesting species. Highest densities of breeding pairs occurred in shelterbelts. Others were found in prairie thickets and isolated shrubs in upland native prairie. Two nests containing four young each were found on 24 June, one in a

shelterbelt and one in a wolfberry patch in upland native prairie.

Western Kingbird (*Tyrannus verticalis*): Common nesting species; largest densities of breeding pairs occurred in shelterbelts. Four nests were found on 24 June; three with three young and one with four young. Upland native prairie and edges of cropland were regularly used for foraging.

Great Crested Flycatcher (*Myiarchus crinitus*): One male was heard singing in a shelterbelt on 25 June. This species is rare and local throughout this region of North Dakota (Stewart 1975).

Willow Flycatcher (*Empidonax trailii*): Fairly common nesting species, restricted almost exclusively to prairie thickets. Only one pair was found away from that habitat type. No nests were found.

Least Flycatcher (*Empidonax minimus*): Rare and local nesting species, found only in shelterbelts. One nest was found about 4.5 m from the ground on 27 June. The breeding population was estimated at five pairs.

Eastern Wood Pewee (*Contopus virens*): One pair was found in a shelterbelt on 26 June. No other population data were collected.

FAMILY ALAUDIDAE

Horned Lark (*Eremophila alpestris*): Common nesting species of cropland fields and heavily grazed native prairie. Recently fledged young were found throughout the study area as early as 21 May.

FAMILY HIRUNDINIDAE

Tree Swallow (*Iridoprocne bicolor*): Common migrant and rare nesting species. During late April, up to 100 individuals per day were found foraging over open areas of permanent wetlands. During the nesting season, three pairs were observed; no nests were found.

Bank Swallow (*Riparia riparia*): Uncommon migrant and rare nesting species. On 24 June, 10 nesting burrows were found in an exposed slope on the north side of lower Sheyenne Lake. This was the only habitat suitable for bank swallow nests in the study area.

Rough-winged Swallow (*Stelgidopteryx ruficollis*): Two birds were observed foraging in a mixed-species flock of barn and cliff swallows over the Sheyenne River at the Highway 14 bridge on 24 June. Stewart (1975) found no evidence of rough-winged swallow nesting in Sheridan or Wells counties, North Dakota. The lack of suitable cliff sites for nest placement is a major limiting factor.

Barn Swallow (*Hirundo rustica*). Common nesting species; pairs were restricted primarily to farmsites and highway bridges for nest placement. Birds were regularly encountered foraging over all major habitats in the study area.

Cliff Swallow (*Petrochelidon pyrrhonata*). Fairly common nesting species; pairs were restricted almost exclusively to highway bridges and other artificial structures for nest placement. Foraging birds were regularly encountered over all major habitats. The largest nesting association was 41 pairs beneath the Highway 14 bridge over the Sheyenne River.

FAMILY CORVIDAE

Blue Jay (*Cyanocitta cristata*). Rare and local nesting species, found primarily in dense groves of hawthorn in prairie thickets and occasionally in shelterbelts. No population data were obtained.

Black-billed Magpie (*Pica pica*). An adult with three recently fledged young was observed in Sec. 12, T. 148 N., R. 74 W., on 26 June. A bulky stick nest, probably that used by the adults, was found in a nearby prairie thicket. Stewart (1975) found the major range in North Dakota west and north of the study area.

Common Crow (*Corvus brachyrhynchos*). Occasional small flocks were observed throughout the study area during late April. One common crow was found in a shelterbelt on 26 June. No other breeding season data were collected.

FAMILY PARIDAE

Black-capped Chickadee (*Parus articapillus*). Rare and local during the breeding season; apparently occurring only in shelterbelts. The breeding population was estimated at 10 pairs.

FAMILY SITTIDAE

White-breasted Nuthatch (*Sitta carolinensis*). Rare and local during the nesting season; two breeding pairs were found in shelterbelts during June. No other population data were gathered.

FAMILY CETHIIDAE

Brown Creeper (*Certhia familiaris*). One individual was found in a shelterbelt on 17 April. This species is an uncommon migrant in areas of North Dakota away from large riparian woodland tracts.

FAMILY TROGLODYTIDAE

House Wren (*Troglodytes aedon*). Rare and local nesting species occurring in shelterbelts, prairie thickets, and tree groves near farm buildings. The breeding population was estimated at 38 pairs.

Long-billed Marsh Wren (*Telmatodytes palustris*). Common nesting species, restricted primarily to dense growths of cattail and hardstem bulrush on the periphery of semipermanent and permanent wetlands. Eleven nests were found on 24 and 25 June, of which four were active.

Short-billed Marsh Wren (*Cistothorus platensis*). Rare and local nesting species. Breeding pairs were found only in dense vegetation in seasonal wetlands. The breeding population was estimated at five pairs.

FAMILY MIMIDAE

Gray Catbird (*Dumetella carolinensis*). Fairly common migrant and nesting species. Breeding densities were similar in both prairie thicket and shelterbelts.

Brown Thrasher (*Toxostoma rufum*). Uncommon nesting species occurring in prairie thickets and brushy portions of shelterbelts. Two nests containing three and four eggs were found in a prairie thicket on 26 June.

FAMILY TURDIDAE

American Robin (*Turdus migratorius*). Fairly common nesting species occurring in prairie thickets, shelterbelts, and farmsites. Recently fledged young were found during late June, and four active nests, probably second broods, were found in late June. The breeding population was estimated at 146 pairs.

Hermit Thrush (*Catharus guttatus*). Two were found in a prairie thicket on 18 April.

Veery (*Catharus fuscescens*). Fairly common migrant during late May, in prairie thickets and shelterbelts.

FAMILY SYLVIIDAE

Golden-crowned Kinglet (*Regulus satrapa*). Fairly common migrant in prairie thickets and shelterbelts during late April.

FAMILY MOTACILLIDAE

Water Pipit (*Anthus spinoletta*). Fairly common migrant during late May. Most frequently encountered on the exposed periphery of seasonal wetlands, and in fallow fields.

Sprague's Pipit (*Anthus spragueii*): Uncommon nesting species. Highest breeding densities occurred in wet meadows. Lesser numbers of breeding pairs occupied upland native prairie. One nest containing three eggs was found on 25 June in a wet meadow in Sec. 21, T. 149 N., R. 75 W. The breeding population was estimated at 33 pairs.

FAMILY BOMBYCILLIDAE

Cedar Waxwing (*Bombycilla cedrorum*): A flock of 13 and another of 22 was found in separate prairie thickets on 24 June. No other evidence of possible breeding was obtained.

FAMILY LANIIDAE

Loggerhead Shrike (*Lanius ludovicianus*): Rare and local nesting species. The breeding population was estimated at 12 pairs based on observations throughout the study area. All breeding pairs were found in or near shelterbelts. Because of the declining status of this species continent-wide (Arbib 1979), it was encouraging to find this many pairs on a relatively small area.

FAMILY STURNIDAE

Starling (*Sturnus vulgaris*): Uncommon and localized during the nesting season. All observations were of pairs in tree groves near farm buildings. No population data were obtained.

FAMILY VIREONIDAE

Solitary Vireo (*Vireo solitarius*): Two solitary vireos were found in a shelterbelt on 22 May.

Red-eyed Vireo (*Vireo olivaceus*): One singing male was found in a shelterbelt on 25 June.

Warbling Vireo (*Vireo gilvus*): Uncommon nesting species, found only in shelterbelts. The breeding population was estimated at 35 pairs.

FAMILY PARULIDAE

Black-and-white Warbler (*Mniotilta varia*): Three birds were found in separate prairie thickets on 21 and 22 May.

Tennessee Warbler (*Vermivora peregrina*): Probably a common migrant. During late May, this species was found regularly in nearly all wooded habitats in the study area.

Orange-crowned Warbler (*Vermivora celata*): Probably a common migrant. Eleven orange-crowned warblers were found in shelterbelts during late April, and one was found in a prairie thicket on 22 May. This was past the normal period of peak migration for this species.

Yellow Warbler (*Dendroica petechia*): Common migrant and nesting species. Breeding pairs occurred in emergent vegetation around basin wetlands, wet meadows, prairie thickets, shelterbelts, and in low, wet areas of upland native prairie. Eleven nests were found during late June.

Magnolia Warbler (*Dendroica magnolia*): One was found in a prairie thicket on 22 May.

Yellow-rumped Warbler (*Dendroica coronata*): Nine were found in one prairie thicket, and four in a shelterbelt on 18 April. On 21 May, one was found in a shelterbelt. Field work in 1980 did not coincide with the usual peak migration period of this species.

Blackburnian Warbler (*Dendroica fusca*): Two males were found in a prairie thicket on 22 May.

Blackpoll Warbler (*Dendroica striata*): Two males and one female were found in a prairie thicket on 21 May.

Palm Warbler (*Dendroica palmarum*): One was found at the edge of a seasonal wetland on 23 April, and two were found in a prairie thicket on 22 May.

Northern Waterthrush (*Seiurus noveboracensis*): Probably a fairly common migrant. During 21 to 22 May, 21 northern waterthrushes were observed; 17 of these were in prairie thickets, the remainder in shelterbelts.

Common Yellowthroat (*Geothlypis trichas*): Common nesting species. Largest breeding densities occurred in the dense emergent vegetation of semipermanent and permanent wetlands. Lower numbers were found in prairie thickets, and occasional pairs occupied low, wet areas in upland native prairie.

Wilson's Warbler (*Wilsonia pusilla*): One was found in a shelterbelt on 22 May.

American Redstart (*Setophaga ruticilla*): Three males and two females were found in a shelterbelt on 21 May. One male was found in a prairie thicket on 22 May.

FAMILY PLOCEIDAE

House Sparrow (*Passer domesticus*): Fairly common although localized resident. Breeding pairs were found associated with farm buildings throughout the study area.

FAMILY ICTERIDAE

Bobolink (*Dolichonyx orzivorus*): Fairly common nesting species, restricted almost exclusively to wet meadows. Breeding pairs also occupied wetter portions of dry seasonal wetlands. Two nests were found during late June in wet meadows, both containing four eggs. Mean density in wet meadows was 34.0 pairs/km².

Western Meadowlark (*Sturnella neglecta*): Common nesting species reaching largest density in upland native prairie. Breeding pairs also occurred in drier portions of wet meadows. One nest containing four nearly fledged young was found on 24 June.

Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*): Abundant nesting species, probably the most numerous breeding bird in the study area. Highest densities occurred in the dense emergent vegetation of semipermanent and permanent wetlands. Breeding pairs also occupied wet meadows. During late May, 38 nests containing 149 eggs were found. Seventeen nests containing 67 eggs were found in June. By late June, recently fledged young were numerous in wetlands.

Red-winged Blackbird (*Agelaius phoeniceus*): Abundant nesting species occupying virtually all habitats. Highest densities occurred in semipermanent wetlands and prairie thickets. Twelve nests containing 51 eggs were found.

Orchard Oriole (*Icterus spurius*): Fairly common nesting species in shelterbelts; not recorded in other habitats. The breeding population was estimated at 113 pairs.

Northern Oriole (*Icterus galbula*): Fairly common nesting species in wooded habitats. Largest breeding densities occurred in shelterbelts. The breeding population was estimated at 126 pairs. Two females were found feeding young in separate nests on 25 June.

Rusty Blackbird (*Euphagus carolinus*): A flock of 37 rusty blackbirds was found foraging in the emergent vegetation of a semipermanent wetland on 18 April.

Common Grackle (*Quiscalus quiscula*): Common nesting species. Highest breeding densities occurred in shelterbelts and prairie thickets. Foraging birds were regularly found in wheat and sunflower fields during May and June. Fifteen nests containing 49 young were found in shelterbelts during late May. By late June, recently fledged young were numerous in most habitats.

Brown-headed Cowbird (*Molothrus ater*): Abundant nesting species occupying virtually all habitats. Highest breeding densities were found in semipermanent wetlands and upland native prairie. One brown-headed cowbird egg was found in an American robin nest on 25 June.

FAMILY FRINGILLIDAE

Rose-breasted Grosbeak (*Pheucticus ludovicianus*): Rare and local nesting species. Singing males were found in three separate shelterbelts on 24 and 27 June. One female was found incubating on 27 June. No other population data were collected.

Pine Siskin (*Carduelis pinus*): Three pine siskins were observed in a shelterbelt on 17 April.

American Goldfinch (*Carduelis tristis*): Fairly common nesting species. Highest densities occurred in prairie thickets. Occasional singing males were found in shelterbelts scattered throughout the study area.

Rufous-sided Towhee (*Pipilo erythrophthalmus*): One male was found in a prairie thicket on 22 May.

Lark Bunting (*Calamospiza melanocorys*): Common nesting species restricted to upland native prairie. Four nests, each containing four eggs, were found during June.

Savannah Sparrow (*Passerculus sandwichensis*): Abundant nesting species in wet meadows. Less common and more localized in wetter portions of dried seasonal wetlands.

Grasshopper Sparrow (*Ammodramus savannarum*): Common nesting species, reaching highest densities in upland native prairie; less common in drier portions of wet meadows. One nest containing two nearly fledged young was found in upland prairie on 25 June.

Baird's Sparrow (*Ammodramus bairdii*): Uncommon nesting species. Densities of breeding pairs were nearly equal in both upland native prairie and drier portions of wet meadows. The breeding population was estimated at 130 pairs.

Le Conte's Sparrow (*Ammodramus leconteii*): Uncommon nesting species restricted exclusively to brackish wet meadows. The breeding population was estimated at 84 pairs. One nest containing five eggs was found on 26 June. The largest density on a census plot was 43.2 pairs/km². Le Conte's sparrow is locally common in the Northwestern Drift Plain (Stewart 1975).

Sharp-tailed Sparrow (*Ammodramus caudacuta*): Uncommon nesting species reaching highest densities in brackish wet meadows. Breeding pairs were also found in drier portions of seasonal wetlands. One singing male was found in a small area of wet sedge vegetation in a prairie thicket. The breeding population was estimated at 40 pairs. Sharp-tailed sparrows apparently occur in highest density in North Dakota during years of extreme drought (Stewart 1975).

Vesper Sparrow (*Pooecetes gramineus*): Fairly common nesting species reaching its highest density in cropland. Breeding pairs also occurred in upland native prairie. The breeding population was estimated at 152 pairs.

Lark Sparrow (*Chondestes grammacus*): Four males and one female were seen in upland native prairie below the inlet of the McClusky Canal on 23 April. On 26 June, three males were heard singing in shelterbelts in Sec. 8, T. 148 N., R. 74 W.

Dark-eyed Junco (*Junco hyemalis*): Seven dark-eyed juncos were observed feeding in a sunflower stubble field on 17 April.

Tree Sparrow (*Spizella arborea*): Five tree sparrows were found with the dark-eyed juncos mentioned above on 17 April.

Chipping Sparrow (*Spizella passerina*): Rare and local nesting species. Singing males were found in two separate shelterbelts on 27 June.

Clay-colored Sparrow (*Spizella pallida*): Fairly common nesting species occurring in largest densities in dense patches of wolfberry in upland native prairie. Breeding pairs were also found in scattered wolfberry patches in prairie thickets. Two nests, each containing three eggs, were found in upland native prairie, one on 24 June and one on 27 June.

Harris' Sparrow (*Zonotrichia querula*): Two males and one female were found in a prairie thicket on 21 May.

White-crowned Sparrow (*Zonotrichia leucophrys*): Fairly common during late May in prairie thickets and shelterbelts.

White-throated Sparrow (*Zonotrichia albicollis*): Apparently a common migrant in wooded habitats during late April. One female was also found on 21 May.

Lincoln's Sparrow (*Melospiza lincolni*): Probably a common migrant. During late May, Lincoln's sparrows were regularly encountered in prairie thickets, shelterbelts, and scattered willow clumps in larger wetlands.

Song Sparrow (*Melospiza melodia*): Fairly common nesting species occurring in highest density in prairie thickets. Breeding pairs also occurred in shelterbelts and edges of semipermanent wetlands.

Lapland Longspur (*Calcarius lapponicus*): Probably an abundant migrant during the peak migration period during late March to mid-April. During late April, flocks of 75-200 individuals were frequently observed in fallow fields. On 21 May, one flock of about 300 was found at the edge of a native prairie tract and a fallow field.

Smith's Longspur (*Calcarius pictus*): On 21 May, two Smith's longspurs were found with the flock of 300 lapland longspurs mentioned above. This is a rare migrant in North Dakota away from the Red River Valley (R. E. Stewart, personal communication).

Chestnut-collared Longspur (*Calcarius ornatus*): Common nesting species, restricted to upland native prairie. During late June, eight nests containing 23 young were found.

Snow Bunting (*Plectrophenax nivalis*): Three snow buntings were seen in a flock of lapland longspurs on 17 April.

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APPENDIX

Common and Scientific Names of Plants Mentioned in Text

Species	Scientific Name	Species	Scientific Name
Alfalfa	<i>Medicago sativa</i>	River bulrush	<i>Scirpus fluviatilis</i>
Alkaligrass	<i>Puccinellia nuttalliana</i>	Rocky Mountain cedar	<i>Juniperus scopulorum</i>
Baltic rush	<i>Juncus balticus</i>	Russian olive	<i>Eleagnus angustifolia</i>
Blue grama	<i>Bouteloua gracilis</i>	Sago pondweed	<i>Potamogeton pectinatus</i>
Box elder	<i>Acer negundo</i>	Saltgrass	<i>Distichlis stricta</i>
Chinese elm	<i>Ulmus pumila</i>	Saltwater widgeongrass	<i>Ruppia maritima</i>
Chokecherry	<i>Prunus virginiana</i>	Silverberry	<i>Eleagnus commutata</i>
Claspingleaf pondweed	<i>Potamogeton richardsonii</i>	Slender bulrush	<i>Scirpus heterochaetus</i>
Common caragana	<i>Caragana arborescens</i>	Slender sedge	<i>Carex praegracilis</i>
Common cattail	<i>Typha latifolia</i>	Slough grass	<i>Beckmannia syzigachne</i>
Coontail	<i>Ceratophyllum demersum</i>	Slough sedge	<i>Carex atherodes</i>
Fowl mannagrass	<i>Glyceria striata</i>	Sunflower	<i>Helianthus annuus</i>
Green ash	<i>Fraxinus pennsylvanica</i>	Switchgrass	<i>Panicum virgatum</i>
Green needlegrass	<i>Stipa viridula</i>	Tall mannagrass	<i>Glyceria grandis</i>
Hardstem bulrush	<i>Scirpus acutus</i>	Water milfoil	<i>Myriophyllum exalbescens</i>
Hawthorn	<i>Crataegus chrysoparia</i>	Water sedge	<i>Carex aquatilis</i>
Marsh smartweed	<i>Polygonum coccineum</i>	Western rose	<i>Rosa woodsii</i>
Needle-and-thread	<i>Stipa comata</i>	Western waterplantain	<i>Alisma plantago-aquatica</i>
Northern reedgrass	<i>Calamagrostis inexpansa</i>	Wheat	<i>Triticum aestivum</i>
Phragmites	<i>Phragmites communis</i>	Whitetop	<i>Scolochloa festucacea</i>
Prairie cordgrass	<i>Spartina pectinata</i>	Wild plum	<i>Prunus americana</i>
Prairie junegrass	<i>Koeleria pyramidata</i>	Wolfberry	<i>Symphoricarpos occidentalis</i>
Red raspberry	<i>Rubus idaeus</i>	Wooly sedge	<i>Carex lanuginosa</i>

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